

## Worksheet CEW-01: FORMAT FOR THE ESTIMATION OF CLOSURE COSTS

\*FILL IN THE BOXES. THE REST WILL BE CALCULATED FOR YOU\*

### Soil Cap Components

#### I Slope & Fill

		Calculation or Conversion	
a. Area to be capped	<input type="text"/> acres	$x 4,840 \text{ yd}^2/\text{ac}$	0 yd <sup>2</sup>
b. Depth of soil needed for slope and fill	<input type="text"/> inches	$x 1 \text{ yd}/36 \text{ in}$	0.00 yd
c. Quantity of soil needed		$a \times b$	0 yd <sup>3</sup>
d. Percentage of soil from off-site	<input type="text"/>		
e. Purchase unit cost for off-site material	<input type="text"/> /yd <sup>3</sup>		
f. Percentage of soil from on-site		$(1 - d)$	100%
g. Excavation unit cost (on-site material)	<input type="text"/> /yd <sup>3</sup>		
h. Total soil unit cost		$(d \times e) + (f \times g)$	\$0.00 /yd <sup>3</sup>
i. Hauling, Placement and Spreading unit cost	<input type="text"/> /yd <sup>3</sup>		
j. Compaction unit cost	<input type="text"/> /yd <sup>3</sup>		
k. Total soil unit cost		$h + i + j$	\$0.00 /yd <sup>3</sup>
l. Soil subtotal		$k \times b$	\$0
m. Percent compaction	<input type="text"/>		
<b>Total Slope &amp; Fill Cost</b>		$l \times (1 + m)$	<b>\$0</b>

#### II Infiltration Layer Soil

##### Infiltration Soil Cost

a. Area to be capped	<input type="text"/> acres	$x 4,840 \text{ yd}^2/\text{ac}$	0 yd <sup>2</sup>
b. Depth of infiltration soil needed	<input type="text"/> inches	$x 1 \text{ yd}/36 \text{ in}$	0.00 yd
c. Quantity of infiltration soil needed		$a \times b$	0 yd <sup>3</sup>
d. Percentage of soil from off-site	<input type="text"/>		
e. Purchase unit cost for off-site material	<input type="text"/> /yd <sup>3</sup>		
f. Percentage of soil from on-site		$(1 - d)$	100%
g. Excavation unit cost (on-site material)	<input type="text"/> /yd <sup>3</sup>		
h. Total infiltration soil unit cost		$(d \times e) + (f \times g)$	\$0.00 /yd <sup>3</sup>
i. Hauling, Placement and Spreading unit cost	<input type="text"/> /yd <sup>3</sup>		
j. Compaction unit cost	<input type="text"/> /yd <sup>3</sup>		
k. Total infiltration soil unit cost		$h + i + j$	\$0.00 /yd <sup>3</sup>
l. Infiltration soil subtotal		$k \times b$	\$0
m. Percent compaction	<input type="text"/>		
n. Subtotal Infiltration Soil Cost		$l \times (1 + m)$	<b>\$0</b>

##### Soil Admixture Cost

o. Area to be capped	<input type="text"/> acres	$x 4,840 \text{ yd}^2/\text{ac}$	0 yd <sup>2</sup>
p. Soil admixture unit cost	<input type="text"/> /yd <sup>2</sup>		
q. Subtotal admixture cost		$a \times b$	\$0

##### Soil Testing

r. Area to be capped	<input type="text"/> acres		
s. Testing unit cost	<input type="text"/> /acre		
t. Subtotal soil testing cost		$a \times b$	\$0
<b>Total Infiltration Soil Cost (soil, admixtures, and testing)</b>		$n + q + t$	<b>\$0</b>

**III. Erosion Control / Protective Cover Soil**

a.	Area to be capped	<input type="text"/>	acres	x 4,840yd <sup>2</sup> /ac	0 yd <sup>2</sup>
b.	Depth of soil needed	<input type="text"/>	inches	x 1yd/36in	0.00 yd
c.	Quantity of soil needed			a x b	0 yd <sup>3</sup>
d.	Percentage of soil from off-site	<input type="text"/>			
e.	Purchase unit cost for off-site material	<input type="text"/>	/yd <sup>3</sup>		
f.	Percentage of soil from on-site			(1 - d)	100%
g.	Excavation unit cost (on-site material)	<input type="text"/>	/yd <sup>3</sup>		
h.	Total erosion/protective soil unit cost			(d x e) + (f x g)	\$0.00 /yd <sup>3</sup>
i.	Hauling, Placement and Spreading unit cost	<input type="text"/>	/yd <sup>3</sup>		
j.	Compaction unit cost	<input type="text"/>	/yd <sup>3</sup>		
k.	Total soil unit cost			h + i + j	\$0.00 /yd <sup>3</sup>
l.	Erosion/Protective soil subtotal			k x b	\$0
m.	Percent compaction	<input type="text"/>			
	<b>Total Erosion Control/Protective Cover Soil Cost</b>			l x (1 + m)	<b>\$0</b>

**IV. Vegetative support soil (Topsoil)**

a.	Area to be capped	<input type="text"/>	acres	x 4,840yd <sup>2</sup> /ac	0 yd <sup>2</sup>
b.	Depth of topsoil needed	<input type="text"/>	inches	x 1yd/36in	0.00 yd
c.	Quantity of topsoil needed			a x b	0 yd <sup>3</sup>
d.	Percentage of topsoil from off-site	<input type="text"/>			
e.	Purchase unit cost for off-site material	<input type="text"/>	/yd <sup>3</sup>		
f.	Percentage of topsoil from on-site			(1 - d)	100%
g.	Excavation unit cost (on-site material)	<input type="text"/>	/yd <sup>3</sup>		
h.	Total topsoil unit cost			(d x e) + (f x g)	\$0.00 /yd <sup>3</sup>
i.	Hauling, Placement and Spreading unit cost	<input type="text"/>	/yd <sup>3</sup>		
j.	Total soil unit cost			h + i	\$0.00 /yd <sup>3</sup>
	<b>Total Topsoil Cost</b>			c x j	<b>\$0</b>

**V. Vegetative Cover**

a.	Area to be vegetated	<input type="text"/>	acres		
b.	Vegetative cover (seeding) unit cost	<input type="text"/>	/acre		
c.	Erosion control matting unit cost	<input type="text"/>	/acre		
	<b>Total Vegetative Cover Cost</b>			a x (b + c)	<b>\$0</b>

**Soil Cap Component Subtotal (I + II + III + IV + V): \$0**

**Geosynthetic Barrier & Infiltration Layers****VI. Flexible Membrane Liner**

				<u>Calculation or Conversion</u>	
a.	Quantity of FML needed	<input type="text"/>	acres	x 43,560ft <sup>2</sup> /ac	0 ft <sup>2</sup>
b.	Purchase unit cost	<input type="text"/>	/ft <sup>2</sup>		
c.	Installation unit cost	<input type="text"/>	/ft <sup>2</sup>		
d.	Total FML unit cost			b + c	
	<b>Total FML cost</b>			a x d	<b>\$0</b>

**VII. Geosynthetic Clay Liner**

a.	Quantity of GCL needed	<input type="text"/>	acres	x 43,560ft <sup>2</sup> /ac	0 ft <sup>2</sup>
b.	Purchase unit cost	<input type="text"/>	/ft <sup>2</sup>		
c.	Installation unit cost	<input type="text"/>	/ft <sup>2</sup>		
d.	Total GCL unit cost			b + c	\$0.00 /ft <sup>2</sup>
	<b>Total GCL Cost</b>			a x d	<b>\$0</b>

**Geosynthetic Layers Subtotal (VI + VII): \$0**

## Drainage Components

### VIII. Sand or Gravel Drainage

		Calculation or Conversion	
a. Area to be capped	<input type="text"/> acres	$\times 4,840 \text{ yd}^2/\text{ac}$	0 yd <sup>2</sup>
b. Depth of sand or gravel needed	<input type="text"/> inches	$\times 1 \text{ yd}/36 \text{ in}$	0.00 yd
c. Quantity of drainage material needed		$a \times b$	0 yd <sup>3</sup>
d. Percentage of media from off-site	<input type="text"/>		
e. Purchase unit cost for off-site material	<input type="text"/> /yd <sup>3</sup>		
f. Percentage of material from on-site		$(1 - d)$	100%
g. Excavation unit cost (on-site material)	<input type="text"/> /yd <sup>3</sup>		
h. Total drainage material unit cost		$(d \times e) + (f \times g)$	\$0.00 /yd <sup>3</sup>
i. Hauling, Placement and Spreading unit cost	<input type="text"/> /yd <sup>3</sup>		
j. Compaction unit cost	<input type="text"/> /yd <sup>3</sup>		
k. Total drainage material unit cost		$h + i + j$	\$0.00 /yd <sup>3</sup>
l. Drainage material subtotal		$k \times b$	\$0.00
m. Percent compaction	<input type="text"/>		
<b>Total drainage material cost</b>		$l \times (1 + m)$	<b>\$0</b>

### IX. Geotextile

a. Quantity of geotextile needed	<input type="text"/> acres	$\times 43,560 \text{ ft}^2/\text{ac}$	0 ft <sup>2</sup>
b. Purchase unit cost	<input type="text"/> /ft <sup>2</sup>		
c. Installation unit cost	<input type="text"/> /ft <sup>2</sup>		
d. Total geotextile unit cost		$b + c$	\$0.00 /ft <sup>2</sup>
<b>Total Geotextile Cost</b>		$a \times d$	<b>\$0</b>

### X. Geonet Composite

a. Quantity of geonet composite needed	<input type="text"/> acres	$\times 43,560 \text{ ft}^2/\text{ac}$	0 ft <sup>2</sup>
b. Purchase unit cost	<input type="text"/> /ft <sup>2</sup>		
c. Installation unit cost	<input type="text"/> /ft <sup>2</sup>		
d. Total geonet composite unit cost		$b + c$	\$0.00 /ft <sup>2</sup>
<b>Total Geonet Composite Cost</b>		$a \times d$	<b>\$0</b>

### XI. Drainage Tile

a. Length of drainage tile needed	<input type="text"/> LF		
b. Purchase unit cost	<input type="text"/> /LF		
c. Trenching and backfilling cost	<input type="text"/> /LF		
d. Total drainage tile unit cost		$b + c$	\$0.00 /ft <sup>2</sup>
<b>Total Drainage Tile Cost</b>		$a \times d$	<b>\$0</b>

**XII. Drainage Channels (Stormwater Control)****Drainage benches and berms**

a. Size of drainage bench needed	<input type="text"/>	LF		
b. Drainage bench unit cost	<input type="text"/>	/LF		
c. Subtotal drainage bench cost			$a \times b$	\$0
d. Size of drainage swale/berm needed	<input type="text"/>	LF		
e. Drainage swale/berm unit cost	<input type="text"/>	/LF		
f. Subtotal drainage swale/berm cost			$d \times e$	\$0

**Rip Rap**

g. Quantity of Rip Rap needed	<input type="text"/>	yd2		
h. Rip rap unit cost	<input type="text"/>	/yd2		
i. Total rip rap cost			$g \times h$	\$0

**Gabian Baskets**

j. Quantity of gabian baskets needed	<input type="text"/>	yd3		
k. Gabian basket unit cost	<input type="text"/>	/yd3		
l. Subtotal gabian basket cost			$j \times k$	\$0

**Total Stormwater Control**  $c + f + i + l$  **\$0**

**Drainage Component Subtotal (VIII + IX + X + XI+ XII): **\$0****

**Landfill Gas and Groundwater Features****XIII. Landfill Gas Monitoring & Control Components**Calculation**Landfill Perimeter System**

a. Number of probes to be installed	<input type="text"/>	probes		
b. LFG probe unit cost	<input type="text"/>	/probe		
c. Subtotal LFG probe cost			$a \times b$	\$0

**Landfill Control Systems**

d. Area to be closed	<input type="text"/>	acres		
e. Average number of vents per acre	<input type="text"/>	vents / acre		
f. LFG vent unit cost	<input type="text"/>	/vent		
g. Subtotal LFG vent cost			$d \times e \times f$	\$0
h. Length of header pipe needed	<input type="text"/>	LF		
i. Header pipe unit cost	<input type="text"/>	/LF		
j. Header pipe installation cost	<input type="text"/>	/LF		
k. Subtotal LFG active vent hook-up			$h \times (i + j)$	\$0

**Total Landfill Gas Management Cost**  $c + g + k$  **\$0**

**XIV. Groundwater Monitoring Components**

a. Hydrogeologic study cost	<input type="text"/>			
b. Number of wells to be installed	<input type="text"/>	wells		
c. GW Monitoring Well unit cost	<input type="text"/>	/well		
d. Number of wells > 50 ft length	<input type="text"/>	wells		
e. Additional well length over 50 ft	<input type="text"/>	LF/well		
f. Unit cost for additional well length	<input type="text"/>	/LF		
<b>Total Groundwater Monitoring Well Cost</b>			$a + (b \times c) + (d \times e \times f)$	<b>\$0</b>

**Landfill Gas & Groundwater Features Subtotal (XIII + XIV): **\$0****

**Miscellaneous****XV. Removal and Disposal of Stockpiled Material**Calculation

- a. Quantity of stockpiled materials  yd3  
b. Loading and Hauling unit cost  /yd3  
c. Disposal unit cost  /yd3  
d. **Total Removal/Disposal Cost**

$$a \times (b + c) \quad \$0$$

**XVI. Erosion/Sediment Control**

- a. Quantity of silt fence needed  LF  
b. Silt Fence unit cost  /LF  
**Total Silt Fence Cost**

$$a \times b \quad \$0$$

**XVII. Landfill Access Road**

- a. Size of LF access road  yd2  
b. Depth of gravel needed  inches  
c. Depth of asphalt needed  inches  
d. Total material needed  
e. Road material unit cost  /yd3  
f. Placement/Spreading unit cost  /yd3  
**Total access road cost**

$$\begin{aligned} & \times 1 \text{ yd}/36 \text{ in} & 0.0 \text{ yd} \\ & \times 1 \text{ yd}/36 \text{ in} & 0.0 \text{ yd} \\ & a \times (b + c) & 0 \text{ yd3} \\ & c \times (d + e) & \$0 \end{aligned}$$

**XVIII. Site Security****Fencing**

- a. Length of fencing needed  ft  
b. Fence unit cost  /ft  
c. **Subtotal fencing cost**

$$a \times b \quad \$0$$

**Gate or Barrier**

- d. Number of gates required   
e. Gate unit cost  /gate  
f. **Subtotal gate cost**

$$d \times e \quad \$0$$

**Closed Sign**

- g. Number of signs required   
h. Sign unit cost  /gate  
i. **Subtotal sign cost**  
**Total site security cost**

$$\begin{aligned} & g \times h & \$0 \\ & c + f + i & \$0 \end{aligned}$$

**XIX. Mobilization / Demobilization**

- a. Cost for mobilization/demobilization   
**Total mobilization/demobilization cost**

$$\$0$$

**Miscellaneous Subtotal (XV + ... + XIX):** **\$0****Closure Cost Subtotal (CCS):**  $(I + \dots + XIX)$  **\$0****Contingency (10%):**  $CCS \times 0.10$  **\$0****Engineering & Documentation:**

Construction QA/QC (1%)  $CCS \times 0.01$  **\$0**  
Closure Certification and CQA Report (1%)  $CCS \times 0.01$  **\$0**  
Survey and as-builts (2%)  $CCS \times 0.02$  **\$0**  
Cost for survey and deed notation   
**Total Engineering & Documentation Costs** **\$0**

**Total Closure Cost:**  $CCS + \text{Contingency} + \text{Engineering}$  **\$0**

## Worksheet CEW-02: FORMAT FOR THE ESTIMATION OF POST-CLOSURE COSTS

**\*FILL IN THE BOXES. THE REST WILL BE CALCULATED FOR YOU\***

### I. Groundwater Monitoring

		Calculation or Conversion	
a. Total number of monitoring wells	<input type="text"/>	wells	
b. Total number of sampling events/year	<input type="text"/>	events/yr	$a \times b$ 0 samples/yr
c. Quantity of additional samples (e.g. QA/QC)	<input type="text"/>	samples/event	$a \times c$ 0 samples/yr
d. Total samples per year	<input type="text"/>		$b + c$ 0 samples/yr
e. Analysis unit cost (Table 3.1 constituents)	<input type="text"/>	/sample	
f. <i>Total Analysis cost</i>		$d \times e$	\$0.00 /yr
g. GW Monitoring unit cost	<input type="text"/>	/event	
i. <i>Total sampling cost</i>		$f + (g \times b)$	\$0.00 /yr
j. Engineering fees & reports	<input type="text"/>	/yr	
<b>Yearly Groundwater Monitoring Cost</b>		$f + i + j$	<b>\$0 /yr</b>

### II. Landfill Gas Monitoring, Maintenance, and Control

a. Frequency of LFG compliance monitoring	<input type="text"/>	events/yr	
b. LFG Monitoring unit cost	<input type="text"/>	/event	
c. <i>Total perimeter LFG monitoring cost</i>		$a \times b$	\$0 /yr
d. Frequency of surface monitoring (air permit)	<input type="text"/>	events/yr	
e. Surface monitoring unit cost	<input type="text"/>	/event	
f. <i>Total surface monitoring cost</i>		$d \times e$	\$0 /yr
g. Control system operating unit cost	<input type="text"/>	/yr	
h. Frequency of LFG control system inspections	<input type="text"/>	events/yr	
i. Control system inspection cost	<input type="text"/>	/event	
j. <i>Total control system cost</i>		$g + (h \times i)$	\$0 /yr
<b>Yearly Landfill Gas Monitoring, Maintenance, &amp; Control Cost</b>		$c + f + j$	<b>\$0 /yr</b>

### III. Leachate Management

a. Quantity of leachate generated	<input type="text"/>	gal/yr
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#### On-site Leachate Management or Pre-Treatment

b. On-site treatment operating unit cost	<input type="text"/>	/gal
c. <i>Total on-site management cost</i>		$a \times b$ \$0 /yr

#### Leachate Disposal

d. Private disposal unit cost	<input type="text"/>	/gal
e. POTW disposal unit cost	<input type="text"/>	/gal
f. Direct discharge to POTW unit cost	<input type="text"/>	/gal
g. Pump & Haul unit cost	<input type="text"/>	/gal
h. Subtotal leachate disposal unit cost		$d + e + f + g$ \$0.00
i. <i>Total leachate disposal cost</i>		$a \times h$ \$0 /yr
j. Leachate sampling & analysis unit cost	<input type="text"/>	/sample
k. Frequency of leachate sampling & analysis	<input type="text"/>	sample/yr
l. <i>Total leachate sampling &amp; analysis cost</i>		$j \times k$ \$0.00 /yr
<b>Yearly Leachate Management Cost</b>		$c + i + l$ <b>\$0 /yr</b>

### IV. Cap Maintenance & Repair

a. Closed Landfill Area	<input type="text"/>	acres
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#### Mowing & Fertilization

b. Mowing frequency	<input type="text"/>	visits/yr
c. Mowing unit cost	<input type="text"/>	/acre/visit
d. <i>Total mowing cost</i>		$a \times b \times c$ \$0 /yr
e. Fertilizer frequency	<input type="text"/>	visits/yr
f. Fertilizer unit cost	<input type="text"/>	/acre/visit
g. <i>Total fertilizer cost</i>		$a \times e \times f$ \$0 /yr

**Cap Erosion & Repair**

h. Area to reseed/year		33% x a	- acres
i. Reseeding unit cost	<input type="text"/>		
j. <i>Total reseeding cost</i>		h x i	\$0.00 /yr
k. Area of cap erosion/year		10% x a	0.0 acres
l. Cap erosion repair unit cost	<input type="text"/>		
m. Mobilization/Demobilization	<input type="text"/>		
n. <i>Total cap erosion repair cost</i>		(k x l) + m	\$0 /yr

**Yearly Cap Maintenance & Repair cost**d + g + j + n **\$0 /yr****V. Sediment Basin Maintenance & Repair**

a. Sediment basin cleanout frequency, 1 per	<input type="text"/> 3	years	1 / a	0.33 event/yr
b. Sediment basin cleanout unit cost	<input type="text"/>	/event		
c. Mobilization/Demobilization	<input type="text"/>	/event		
d. <i>Total sediment basin maintenance cost</i>			a x (b + c)	\$0 /yr
e. Total number of stormwater sampling locations	<input type="text"/>	locations		
f. Stormwater sampling frequency	<input type="text"/>	events/yr		
g. Total number of stormwater samples			e x f	0 samples/yr
h. Analysis unit cost (VPDES permit parameters)	<input type="text"/>	/sample		
i. <i>Total Analysis cost</i>			g x h	\$0 /yr
j. Mobilization unit cost	<input type="text"/>	/event		
k. Technician field unit cost	<input type="text"/>	/event		
l. <i>Total sampling cost</i>			f x (j + k)	\$0.00 /yr
m. Engineering fees & reports	<input type="text"/>	/yr		
n. <i>Total Stormwater Sampling &amp; Analysis cost</i>			f + i + j	\$0 /yr

**Yearly Sediment Basin Maintenance & Repair**d + n **\$0 /yr****VI. Vector & Rodent Control**

a. Vector and rodent control unit cost	<input type="text"/>	/yr		
<b>Yearly Vector and Rodent Control Cost</b>			a	<b>\$0 /yr</b>

**VII. Post-Closure Care General Inspections**

a. General Inspection unit cost	<input type="text"/>	/inspection		
b. Number of inspections per year	<input type="text"/>			
<b>Yearly Post-Closure Care General Inspection Cost</b>			a x b	<b>\$0 /yr</b>

**Annual Post-Closure Care Cost (APCC)**I + ... + VII **\$0 /yr****Length of post-closure care (LPCC)** years**Post-Closure Care Cost**APCC x LPCC **\$0****Engineering & Documentation**

Post-Closure Care Evaluation

Post-Closure Care Certification

Cost for survey and deed notation

(if not completed at time of landfill closure)

  
  

Engineering Sum **\$0****FA Mechanism Maintenance Cost**/yrFA maintenance x LPCC **\$0****Total Post-Closure Care Cost**

Post-Closure Cost + Engineering + FA Maintenance

**\$0**